FedHome: Cloud-Edge Based Personalized Federated Learning for In-Home Health Monitoring

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Abstract

In-home health monitoring has attracted great attention for the ageing population worldwide. With the abundant user health data accessed by Internet of Things (IoT) devices and recent development in machine learning, smart healthcare has seen many successful stories. However, existing approaches for in-home health monitoring do not pay sufficient attention to user data privacy and thus are far from being ready for large-scale practical deployment. In this paper, we propose FedHome, a novel cloud-edge based federated learning framework for in-home health monitoring, which learns a shared global model in the cloud from multiple homes at the network edges and achieves data privacy protection by keeping user data locally. To cope with the imbalanced and non-IID distribution inherent in user's monitoring data, we design a generative convolutional autoencoder (GCAE), which aims to achieve accurate and personalized health monitoring by refining the model with a generated class-balanced dataset from user's personal data. Besides, GCAE is lightweight to transfer between the cloud and edges, which is useful to reduce the communication cost of federated learning in FedHome. Extensive experiments based on realistic human activity recognition data traces corroborate that FedHome significantly outperforms existing widely-adopted methods.